Empirical Techniques for Modeling Regional Economic Development Effects in Deep Draft Navigation Studies

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Agenda

- Introduction
- Background
- Method
- Data
- Results
- Conclusions

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Introduction

- What are the effects of a port on the economy of the region in which it is located?
  - How much income is dependant on port activity?
  - How are the effects distributed?
- How can we model these effects?
- Is there a statistically significant relationship between harbor traffic and income for the region?
- What is the economic significance of the relationship?

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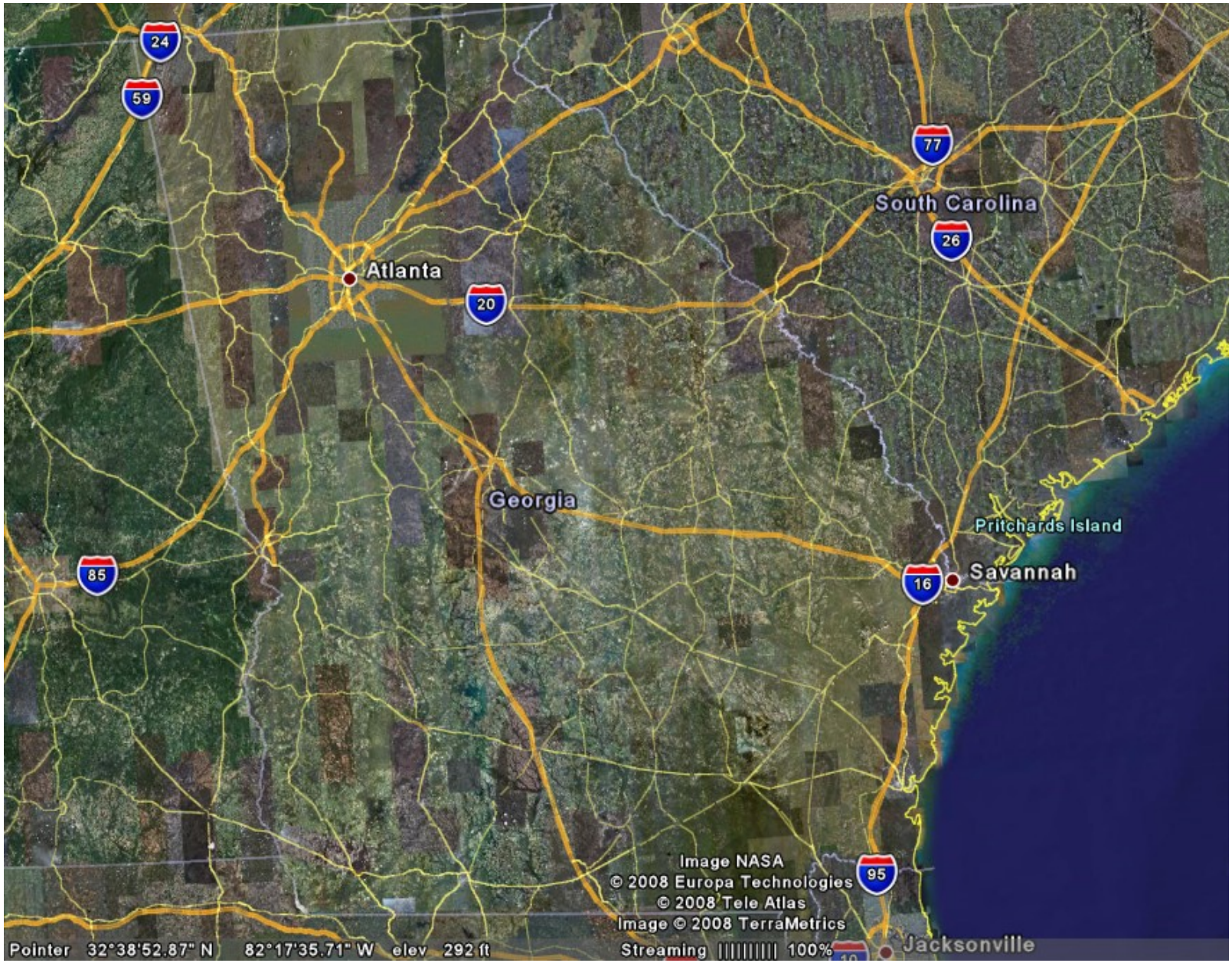
Background

- Savannah Harbor
  - Increasing trade volume
  - Expansion project
- State of Georgia
- Counties in Georgia


24
59
77
South Carolina
26
Atlanta
20
Georgia
Pritchards Island
85
16
Savannah
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95
Pointer 32°38'52.87" N 82°17'35.71" W elev 292 ft
Streaming 100%
Jacksonville

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Method

- Key relationships tested
  - Personal income
  - Port tonnage
  - Lags in the absorption process
  - Distance from port
- Evaluated multiple ways to model the relationships

Method

- Ordinary least squares (OLS) regression model
  - Multiple models testing alternative relationships
  - State tests
  - County tests
  - Lags in the absorption process
  - First differencing

Method

- Microsoft Excel
  - Data Analysis Package
- Google Earth

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Data

- Bureau of Economic Analysis (BEA) http://www.bea.gov
  - State personal income
  - Local area personal income
- Waterborne Commerce of the United States (WCUS) http://www.iwr.usace.army.mil
  - Tonnage

Summary Statistics

	Change in Savannah Tonnage	Change in Georgia Income	Change in Chatham Income	Change in Bryan Income	Change in Effingham Income	Change in Liberty Income
Mean	668,995	8,017,381,242	223,315,818	24,763,576	36,032,576	40,802,606
Std dev	1,287,527	4,504,236,429	104,939,203	18,724,366	29,320,345	27,522,286
Min	-2,105,382	1,853,012,000	71,771,000	1,227,000	4,558,000	2,816,000
Max	4,808,000	19,277,885,000	539,769,000	81,625,000	138,560,000	111,364,000
n	33	33	33	33	33	33

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Results for Georgia

Adjusted R-Square	0.606
Standard Error	2827436406
Observations	33
F-Stat	17.403
Degrees of Freedom	29

Variable	**dIncome-1**	**dTonnage-1**	**dTonnage**	**Intercept**
Coefficient (β)	0.760	511.730	882.595	1439362995
Standard Error	0.122	418.223	403.192	1049249542
P-Value	0.000	0.231	0.037	0.181
T-Stat	6.255	1.224	2.189	1.372

- Previous year change in tonnage appears slightly significant
  - P-value = 0.231
- Current year change in tonnage appears highly significant
  - P-value = 0.037

Results for Chatham

Adjusted R-Square		0.418	
Standard Error		80078816	
Observations		33	
F-Stat		12.476	
Degrees of Freedom		30	
Variable	**dYear**	**dTonnage-1**	**Intercept**
Coefficient (β)	5858131	22.164	-11442573669
Standard Error	1542472	11.766	3065665045
P-Value	0.001	0.069	0.001
T-Stat	3.798	1.884	-3.732

- Previous year change in tonnage appears somewhat significant
  - P-Value = 0.069
- F-test confirmed that restricted model is preferable

Results for Effingham

Adjusted R-Square			0.755	
Standard Error			14525382	
Observations			33	
F-Stat			33.796	
Degrees of Freedom			29	
Variable	**dYear**	**dTonnage-1**	**dTonnage**	**Intercept**
Coefficient (β)	1886649	7.194	4.723	-3724238580
Standard Error	294715	2.163	2.175	585403434
P-Value	0.000	0.002	0.038	0.000
T-Stat	6.402	3.326	2.172	-6.362

- Previous year change in tonnage appears highly significant
  - P-Value = 0.002
- Current year change in tonnage appears highly significant
  - P-Value = 0.038

Results for Bryan

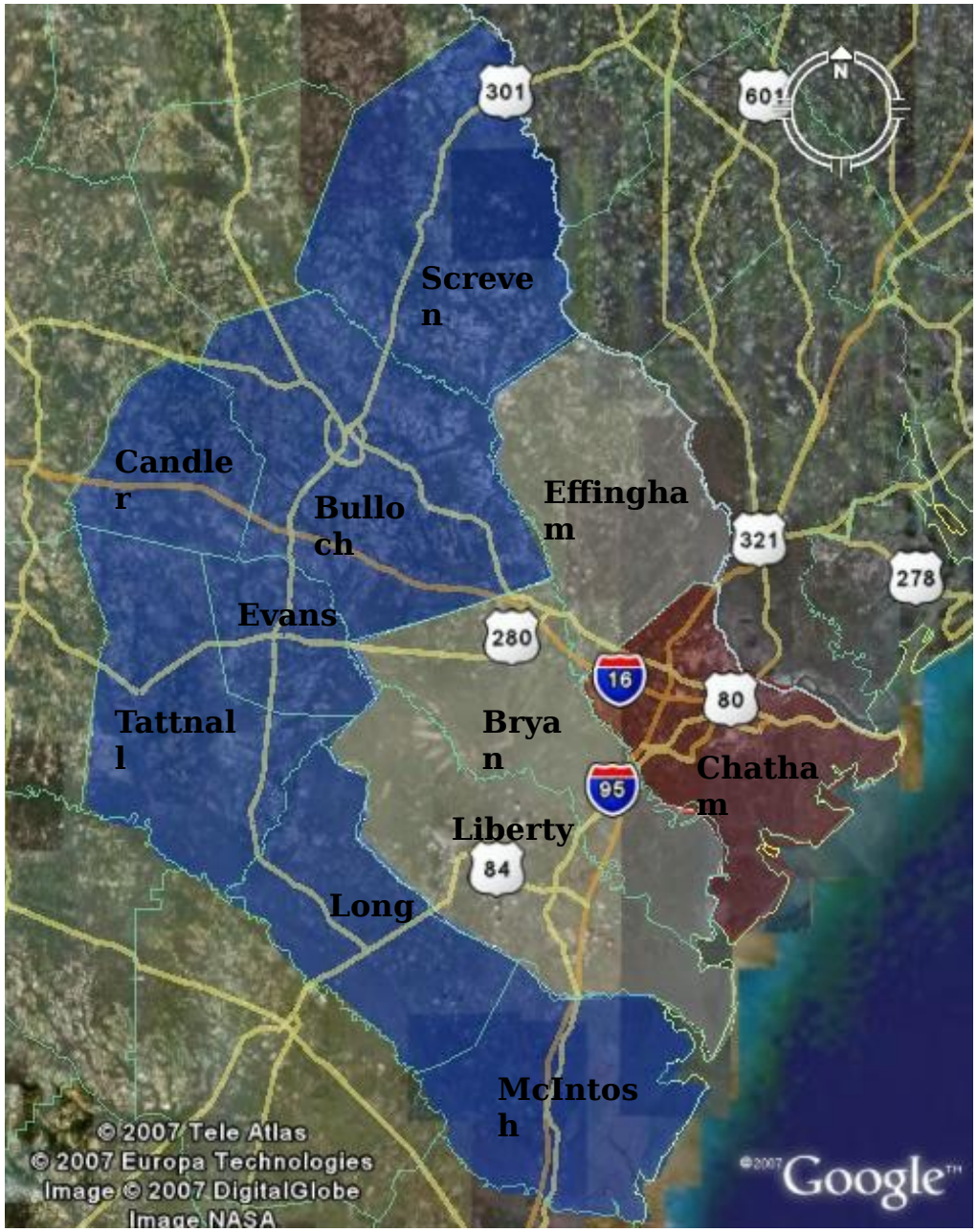
Adjusted R-Square			0.844	
Standard Error			7401594	
Observations			33	
F-Stat			58.597	
Degrees of Freedom			29	
Variable	**dYear**	**dTonnage-1**	**dTonnage**	**Intercept**
Coefficient (β)	1478224	3.876	1.464	-2918863894
Standard Error	150175	1.102	1.108	298299802
P-Value	0.000	0.001	0.197	0.000
T-Stat	9.843	3.517	1.321	-9.785

- Previous year change in tonnage appears highly significant
  - P-Value = 0.001
- Current year change in tonnage appears slightly significant
  - P-Value = 0.197

Results for Liberty

Adjusted R-Square			0.460	
Standard Error			20224844	
Observations			33	
F-Stat			10.086	
Degrees of Freedom			29	
Variable	**dYear**	**dTonnage-1**	**dTonnage**	**Intercept**
Coefficient (β)	1429064	4.352	4.751	-2807546995
Standard Error	410355	3.011	3.028	815103767
P-Value	0.000	0.159	0.128	0.002
T-Stat	3.483	1.445	1.569	-3.444

- Previous year change in tonnage appears slightly significant
  - P-Value = 0.159
- Current year change in tonnage appears highly significant
  - P-Value = 0.128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Conclusions

- Found a statistically significant relationship between income and tonnage
- Gained understanding of the economic effects of the port
- Showed spatial and temporal distribution of the effects
  - Distance from port
  - Lag in absorption

The Way Forward

- With and without project conditions
- Effects on neighboring states
- More data means better test results
- Other metrics
  - State product
  - Employment

Key Takeaway Points

- There is a statistically significant relationship between port tonnage and personal income
- Regional economic development can be performed with empirical techniques
- Regression analysis is a powerful and flexible tool